

ASTRONOMICAL SOCIETY OF LONDON.

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No. 24.

THE following communications were read :—

1. Extract of a letter from Professor Schumacher to Francis Baily, Esq.

Occultation of Aldebaran, Altona, Dec. 9, 1829 :

Im.	23	41	12,27	} Sidereal time, very exactly observed.
Em.	0	40	51,40	

“ There were five observers, so placed that no one could be disturbed by the others. Each had his chronometer, compared before and after with the transit clock. *We saw nothing uncommon at this observation.* The immersion and emersion appeared instantaneous to all, except to Mr. Peterson, who fancied that the star adhered to the bright limb of the moon for a second, at the emersion. But the telescope used by this gentleman was the least perfect of the whole, and shews the stars not as small round discs, but with emerging rays.”

2. Extract of a letter from George Dollond, Esq. to W. S. Stratford, Esq.

“ The immersion of Aldebaran was observed (Dec. 9, 1829) at Ormskirk, near Liverpool, by the Rev. W. R. Dawes, at 5^h 36^m 20^s.25 mean solar time (N. latitude 53° 34' 15")

Resulting longitude	11	36,5	West.
Longitude previously determined .	11	36,0	

“ I have just received the monthly notice for November, containing a summary of the observations of Aldebaran. The appearances are so variable and uncertain, that I am convinced there is an optical deception depending upon the eye; and I believe the phenomena will vary as the observer directs his particular attention to the moon or to the star.

“ On the 21st of August, I observed the occultation, and directed my attention particularly to the limb of the moon, allowing the star to approach, when it gradually disappeared behind the moon, until one-half of its apparent disc was hidden, the last half disappearing instantaneously. I also had an observation of the emersion on the 9th of December, when I allowed the star to pass from the moon for about two seconds, and then directed my attention particularly to the star. *It appeared to stop, and then return towards the moon's limb.*”

3. Observations made with a sextant of Dollond and a reflecting circle of Troughton, for ascertaining within what degree of

accuracy these instruments would give the latitude of a *known* station, by Capt. Basil Hall, R.N.

At the request of Mr. Henderson, who was desirous of ascertaining the degree of accuracy to be expected from nautical instruments, Captain Hall undertook a series of observations to determine the latitude of the Calton Hill Observatory. The instruments used were, a sextant by Dollond, of 11 inches radius divided to 10", the telescope magnifying eighteen times; a reflecting circle by Troughton, 10 inches diameter, divided to 20", with three verniers; and an artificial horizon by Dollond. The time was taken from a half seconds' chronometer by Molyneux, compared before and after the observations with the transit clock.

The latitude of the Calton Hill Observatory, as determined by Mr. Henderson from the data of the Trigonometrical Survey, is $55^{\circ} 57' 19''.5$.

The computations were made by Mr. Henderson from Schumacher's Hülfsstafeln, and *no observation rejected*.

DOLLOND'S SEXTANT.

The index always moved the same way in making the observation and determining the index error.

	Latitude.
1829, Sept. 9, by a mean of 24 circum-meridional observations of the sun	$55^{\circ} 57' 20''.0$
16, by a mean of 16 (roof of horizon reversed)	$55^{\circ} 57' 18''.1$
by a mean of 40	$55^{\circ} 57' 19''.0$

TROUGHTON'S REFLECTING CIRCLE.

Captain Hall conceives there is a slight degree of flexure in the index bar; and that, if the index be pushed from the zero, face left, and also from the zero, face right, the angles given by the vernier will in both cases be too great, and *versá vice*.* To obviate this error, care was taken to move the index *in the same direction*, face right and face left.

	Latitude.
Sept. 12, 13, 14, 15, 16, by a mean of 58 circum-meridional observations of the sun, face east, face west, the roof reversed, &c.	$55^{\circ} 57' 16''.9$

CAPTAIN KATER'S LITTLE CIRCLE (THREE INCHES DIAMETER).

Sept. 11, by a mean of 10 observations of Polaris	$55^{\circ} 57' 15''.0$
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The observations were made in the passage of the Observatory, leading to the centre of the building; and Capt. Hall is enabled to contradict most satisfactorily an opinion that the Edinburgh Observatory is unstable or liable to tremors. Though the hill was covered with people, the streets below traversed by carriages and waggons, and workmen were carrying on their operations within the enclosure

* [If these precautions be neglected, it would seem, from Capt. Hall's observations, that an extreme difference of 13" might arise in his circle from this cause alone. Query. Does not this difference arise from a twist in the centre work?—Sec.]

of the Observatory, Capt. H. declares that he never placed an artificial horizon on ground where there were so few tremors.

4. On the longitude of the Armagh Observatory, as determined by transits of the moon and moon-culminating stars, by Dr. Robinson.

This method of determining the differences of longitude between two distant places is superior to all other methods in ease and simplicity, and would seem to be scarcely inferior in accuracy when a considerable number of observations is employed. Ever since the annual lists of moon-culminating stars have been published, Dr. Robinson has regularly observed them, partly to furnish corresponding observations for other astronomers, and partly to confirm and improve the longitude of Armagh, determined by his predecessors. He was thus led to notice a source of error perhaps not sufficiently attended to, and to adopt a correction which he conceives will add to the accuracy of the results to be obtained.

It is well known that telescopes give different diameters of the heavenly bodies, which appear too large in small and inferior instruments. When such are used, the transit of the moon's first limb will appear too early, and that of the second too late; whence, as the stars are wholly unaffected, the longitudes deduced from observations of a single limb will be erroneous to between twenty and thirty times this spurious increase of disc, compared to the disc shewn by the standard telescope of comparison. This error may be easily eliminated when an equal number of transits of each limb can be obtained, but this is obviously impossible in most cases, and inconvenient in all.

The quantity of this optical defect, as it respects the sun, is easily ascertained for any telescope, by comparing the diameter as given by his transit with that given in the Ephemeris, or by the standard transit telescope. Sixty observations of both limbs gave the solar irradiation of the old Armagh transit compared directly with the Greenwich transit $+ 0^{\circ}.14$, and compared with that of Dublin $+ 0^{\circ}.32$.

Using these comparative solar irradiations respectively as an approximate correction for the lunar irradiation, Armagh was found to be west of Greenwich,—

by 16 corresponding observations	$\gg 1^{\circ} L$ at Armagh and Dublin *	$26^{\text{m}} 23^{\text{s}}.52$
by 10	at Armagh and Greenwich	$26^{\text{m}} 26^{\text{s}}.71$

The differences of these from the true longitude ($26^{\text{m}} 30^{\text{s}}$ W. nearly) previously determined, being so nearly proportional to the assumed or solar irradiation, Dr. R. was led to conjecture that the lunar irradiation may be obtained, generally, by multiplying the solar irradiation by 1.7 .†

* Longitude of Dublin, determined by the Bishop of Cloyne, $25^{\text{m}} 22^{\text{s}}$ W.

† This greater irradiation of the moon may be owing to her greater brilliance, and to the sympathy excited in the adjacent portions of the retina. Dr. R. finds that the lunar irradiation is much less in the day-time. During the winter months, the dark limb of the moon might probably be observed with powerful telescopes, and the irradiation determined.

In 1827 the new transit was put up at Armagh, and the solar irradiation was found, by seventy-four observations, to be $+0^{\circ}.01$ compared with Greenwich, and $+0^{\circ}.19$ with Dublin, through the data of the *Nautical Almanac*; whence the comparative lunar irradiations would be respectively $+0^{\circ}.02$ and $+0^{\circ}.32$, on the preceding hypothesis. With this correction, the longitude of Armagh was found to be

by 10 corresponding observations	1	L Armagh and Dublin	^m 26 30,49 W.
5	2	L	^s 26 30,34 W.
Mean . .			26 30,40

which must be very near the truth.

by 6 corresponding observations at Armagh and Greenwich 26 29,89
but with a much greater probable error.

It would appear, therefore, that this mode of obtaining the comparative lunar irradiation applies to the new transit as well as to the old.*

All the results have been obtained by the method of minimum squares, and the probable errors are also given.

The formula is stated, by which the longitude is deduced from the observations, with a type of the calculation.

* Old transit of Armagh 3 ft. focal length, 2 in. aperture, partly covered by an illuminator.			
New	5	3 $\frac{3}{4}$	limited for sun and moon to 2 $\frac{3}{4}$.
Greenwich transit . .	10	5	
Dublin transit . . .	6	4	of which 2 $\frac{3}{4}$ only are used.